GAS DETECTION BY TWO-PHOTON LIF/ASE

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ABSTRACT

The purpose of this work is to investigate a simple, one-color, single-laser-based system for real time, remote atmospheric monitoring of radionuclide effluents that is within the realm of present day laser technology. A model was developed for remote detection by two-photon, laser-induced fluorescence (LIF) enhanced by amplified, spontaneous emission (ASE). Energy level diagrams and the spectroscopy involved will be presented. An experiment to test and evaluate the modeling results has been carried out and will be described. Overall, qualitative agreement with the modeling studies was obtained, in which three signal response regions were observed, namely a high and low gain regime separated by a transition region covering some nine orders of magnitude in signal level. Both forward and backward ASE was measured in several sets of experiments. The excitation spectrum of the ASE was measured with the "wideband" laser output. Several experiments were also carried out using line-narrowed radiation.

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